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EXAMINER

CANTELMO, GREGG

ART UNIT	PAPER NUMBER
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1745

DATE MAILED: 11/17/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/776,385

Applicant(s)

CHRISTIANSEN, NIELS

Examiner

Gregg Cantelmo

Art Unit

1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 September 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 and 11-17 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-17 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. In response to the amendment received September 4, 2003:
 - a. Claims 1-9 and 11-17 are pending with claim 10 having been cancelled;
 - b. The objection to the drawing has been overcome in light of the amendment. Applicant has stated on the record that no new matter has been introduced;
 - c. The specification objections have been overcome in light of the amendment;
 - d. The claim objections have been overcome in light of the amendment;
 - e. The 112 rejections have been overcome in light of the amendment and in view of Applicant's arguments;
 - f. The prior art rejections have been withdrawn in light of the amendment.

Claim 1 now recites that the gas supply channels are fuel channels. Fuel channels being associated with the anode as opposed to oxidant channels associated with the cathode. None of the previously presented claims recited the term fuel gas supply channels. Thus this new limitation to the claims permits new grounds of rejection necessitated by amendment and finality of this office action.

Drawings

2. The amendment to the drawings was received on September 4, 2003. This drawing is not held to introduce new matter, as stated by Applicant. There appears to be adequate support in the translated foreign priority document and figure.

Claim Objections

3. Claim 9 objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. The claim recites use of the apparatus of claim 1 but does not further limit the structure of the apparatus of claim 1.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1, 4, 5, 9, 12 and 13 are rejected under 35 U.S.C. 102(b) as being anticipated by WO 97/23007 (WO '007).

WO '007 discloses solid oxide fuel cell with a planar support 6 in the form of a porous metal alloy plate 6 (abstract) supporting on one planar surface an anode layer 5

Art Unit: 1745

and with internally elongated fuel gas supply channels 2 formed inside the structure (Fig. 2 as applied to claim 1).

The anode layer 5 is active in electrochemical anode reactions and the layer 5 is covered with a dense layer 4 of electrolyte material (Fig. 1 as applied to claim 4).

Plate 6 is made from nickel or chromium alloys (abstract and paragraph bridging pages 5 and 6 as applied to claim 5).

Claim 9 fails to further limit the structure of the fuel cell and is held to be an intended use of the apparatus of claim 1. Since WO '007 anticipates claim 1, and claim 9 does not further limit the fuel cell of claim 1, WO '007 is held to further anticipate the structure of the fuel cell of claim 9. The prior art structure of WO '007 anticipates the apparatus of claim 1 and thus is held to have the same structure as the instant claimed invention of claims 1 and 9. If a prior art structure is capable of performing the intended use as recited in the preamble, then it meets the claim. See, e.g., *In re Schreiber*, 128 F.3d 1473, 1477, 44 USPQ2d 1429, 1431 (Fed. Cir. 1997) (as applied to claim 9).

The dense electrolyte layer is a ceramic material (page 1, ll. 1-14 as applied to claim 12).

The anode layer 5 is active in electrochemical anode reactions and the layer 5 is covered with a dense layer 4 of electrolyte material (Fig. 1 as applied to claim 13).

Response to Arguments

6. Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 2, 3 and 11 rejected under 35 U.S.C. 103(a) as being unpatentable over WO '007 in view of either U.S. patent No. 6,228,520 (Chiao) or EP 750798-A (EP '798).

The teachings of claim 1 have been discussed above and are incorporated herein.

WO '007 discloses an interconnector 1 on the side opposite to the surface supporting the anode active material 5 (Fig. 2). The interconnector is conductive since it provides the electrical connection between adjacent cells.

The differences between claims 2 and 3 and WO '007 are that WO '007 does not readily disclose of the interconnectors being gas impermeable (claims 2 and 11) or being ceramic and/or metallic (claim 3).

EP '798 discloses a gas impermeable metallic interconnects disposed between adjacent cells. The combination provides a high degree of electrical conductivity between adjacent cells while isolating the fuel gas in the anode of a first cell and the oxidant gas of the cathode in an adjacent cell (abstract as applied to claims 2, 3 and 11).

Chiao discloses using a lanthanum chromite layer 50 between the anode layer of one fuel cell and the cathode layer of an adjacent cell (Fig. 1). The interconnect provides an excellent barrier to gases and excellent conductivity (col. 2, ll. 45-49).

The motivation for using a gas impermeable ceramic or metallic interconnector is to provide both excellent electrical connection between the cells in the stack while also isolating the fuel and oxidant gases between the anode and cathode of adjacent cells.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of WO '007 by using a gas impermeable rim to the anode substrate since it would have provided both excellent electrical connection between the cells in the stack while also isolated the fuel and oxidant gases between the anode and cathode of adjacent cells.

9. Claims 6 and 14 rejected under 35 U.S.C. 103(a) as being unpatentable over WO '007 in view of Buchkremer et al "Advances in the anode supported planar SOFC technology" (hereinafter referred to as Buchkremer).

Plate 6 of WO '007 is made from nickel or chromium alloys (abstract and paragraph bridging pages 5 and 6 as applied to claim 14).

The teachings of claim 1 have been discussed above and are incorporated herein.

The difference between claim 6 and WO '007 is that WO '007 does not readily disclose of the porous anode support plate having a gas impermeable rim.

Buchkremer discloses of a planar SOFC in Fig. 3 wherein the rim of the anode substrate is sealed than thus gas impermeable (also see page 163).

Art Unit: 1745

The motivation for using a gas impermeable rim to the anode substrate is to effectively seal the anode substrate and prevent fuel from escaping the anode substrate in areas other than the electrochemically active area.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of WO '007 by using a gas impermeable rim to the anode substrate since it would have effectively sealed the anode substrate and prevented fuel from escaping the anode substrate in areas other than the electrochemically active area.

10. Claims 6, 7, 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over WO '007 in view of U.S. patent No. 5,589,286 (Iwata).

Plate 6 of WO '007 is made from nickel or chromium alloys (abstract and paragraph bridging pages 5 and 6 as applied to claim 14).

The teachings of claim 1 have been discussed above and are incorporated herein.

The differences between claims 6, 7 and 15 and WO '007 are that WO '007 does not readily disclose of the rim supporting the electrolyte (claim 7) or of the rim of the porous plate being gas impermeable (claims 6 and 15).

Iwata discloses that the electrolyte layer 166B can be used in a planar SOFC arrangement. The electrolyte material is known to be ionically permeable but not gas (fuel/oxidant) permeable. Thus although Iwata teaches of coating the electrolyte layer on the rim of the air electrode (cathode), there is a clear teaching in this reference that the electrolyte can provide an excellent gas barrier to the rim of an electrode in an

Art Unit: 1745

SOFC. Thus one of ordinary skill in the art would have found it obvious to place the electrolyte layer on the rim of the planar fuel electrode of WO '007 with the expectation that it would provide the same ionic permeability and gas impermeability regardless of whether the electrolyte rim layer is disposed on the anode or cathode layer (as applied to claim 7).

This arrangement renders the rim of the porous plate to be gas impermeable (as applied to claims 6 and 15).

The motivation for providing the electrolyte layer on the rim of the fuel electrode (anode) is that it provides gas seal to the edge of the anode and thus effectively isolates the oxidant and fuel gases in the cell.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of WO '007 by providing the electrolyte layer on the rim of the fuel electrode (anode) is that it provides gas seal to the edge of the anode and thus effectively isolates the oxidant and fuel gases in the cell.

11. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over WO '007 in view of U.S. patent No. 5,998,056 (Divisek).

The teachings of claim 1 have been discussed above and are incorporated herein.

The difference between claim 8 and WO '007 is that WO '007 does not readily disclose impregnating the porous structure with a catalyst.

Art Unit: 1745

Fuel cells having internal reforming at the fuel electrode region of the cell are known in the art. Divisek teaches of an anode structure wherein a fuel reforming catalyst material is added to the anode structure itself (abstract).

The motivation for providing a catalyst to the fuel electrode (anode) support is that it provides for internal reforming of the fuel gas in the anode and reduces the need for an external fuel reformer in the fuel cell system.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of WO '007 by providing a fuel reforming catalyst in the anode support since it would have provided for internal reforming of the fuel gas in the anode and reduces the need for an external fuel reformer in the fuel cell system.

12. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over WO '007 in view of Divisek as applied to claim 8 above and in further view of Iwata.

The teachings of claims 1 and 9 have been discussed above and are incorporated herein.

The difference between claim 17 and WO '007 is that WO '007 does not readily disclose providing the electrolyte layer on the rim of the anode (fuel electrode).

Iwata discloses that the electrolyte layer 166B can be used in a planar SOFC arrangement. The electrolyte material is known to be ionically permeable but not gas (fuel/oxidant) permeable. Thus although Iwata teaches of coating the electrolyte layer on the rim of the air electrode (cathode), there is a clear teaching in this references that the electrolyte can provide an excellent gas barrier to the rim of an electrode in an

Art Unit: 1745

SOFC. Thus one of ordinary skill in the art would have found it obvious to place the electrolyte layer on the rim of the planar fuel electrode of WO '007 with the expectation that it would provide the same ionic permeability and gas impermeability regardless of whether the electrolyte rim layer is disposed on the anode or cathode layer (as applied to claim 7).

The motivation for providing the electrolyte layer on the rim of the fuel electrode (anode) is that it provides gas seal to the edge of the anode and thus effectively isolates the oxidant and fuel gases in the cell.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of WO '007 by providing the electrolyte layer on the rim of the fuel electrode (anode) is that it provides gas seal to the edge of the anode and thus effectively isolates the oxidant and fuel gases in the cell.

13. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over WO '007 in view of either Chiao or EP '798 as applied to claim 2 above and in further view of U.S. patent No. 5,998,056 (Divisek).

The teachings of claims 1 and 2 have been discussed above and are incorporated herein.

The difference between claim 17 and WO '007 is that WO '007 does not readily disclose impregnating the porous structure with a catalyst.

Fuel cells having internal reforming at the fuel electrode region of the cell are known in the art. Divisek teaches of an anode structure wherein a fuel reforming catalyst material is added to the anode structure itself (abstract).

Art Unit: 1745

The motivation for providing a catalyst to the fuel electrode (anode) support is that it provides for internal reforming of the fuel gas in the anode and reduces the need for an external fuel reformer in the fuel cell system.

Therefore it would have been obvious to one of ordinary skill in the art at the time the claimed invention was made to modify the teachings of WO '007 by providing a fuel reforming catalyst in the anode support since it would have provided for internal reforming of the fuel gas in the anode and reduces the need for an external fuel reformer in the fuel cell system.

Response to Arguments

14. Applicant's arguments have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

15. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not

Art Unit: 1745

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

16. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregg Cantelmo whose telephone number is (703) 305-0635. The examiner can normally be reached on Monday through Thursday from 8:00 a.m. to 5:30 p.m. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan, can be reached on (703) 308-2383. Note that these telephone numbers will change around January 1, 2004. At such time the examiners new telephone number will be (571) 272-1283 and the examiner's supervisor's number will be (571) 272-1292. FAX communications should be sent to FAX number: (703) 872-9306. FAXES received after 4 p.m. will not be processed until the following business day. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Gregg Cantelmo
Patent Examiner
Art Unit 1745

gc


November 12, 2003